

CLAIMS

1. A backlight unit for illuminating an object to be illuminated using a light source, wherein the backlight unit comprises brightness gradient forming means for forming brightness gradient in the horizontal and vertical directions on a surface to be illuminated of the object to be illuminated.
2. The backlight unit of claim 1, wherein the backlight unit has a reflection portion for causing the light from the light source to exit toward a certain direction, wherein the brightness gradient forming means is provided on the reflection portion, and wherein brightness gradient in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated is formed by controlling the reflectance at the reflection portion.
3. The backlight unit of claim 2, wherein the brightness gradient forming means has a region providing relatively higher reflectance and another region providing relatively lower reflectance at the reflection portion, and wherein brightness gradient in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated is formed by the difference in the reflectance.
4. The backlight unit of claim 3, wherein the brightness

gradient forming means has reflectance gradient whose reflectance changes little by little or step by step at the reflection portion, and wherein relatively higher brightness is obtained at the central portion on the surface to be illuminated of the object to be illuminated and in the vicinity thereof than at peripheral portion by the reflectance gradient.

5. The backlight unit of claim 4, wherein the brightness gradient forming means is a dot pattern provided on the reflection portion, and wherein the reflectance of the reflection portion is controlled by the dot pattern.

6. The backlight unit of claim 5, wherein the reflectance of the reflection portion provided with the dot pattern is controlled by any of the reflectance of a group of fine dots constituting the dot pattern, dot density, dot shape and dot color, or any combination thereof.

7. The backlight unit of claim 5 or 6, wherein the distribution of the fine dots constituting the dot pattern has a substantially elliptical shape.

8. The backlight unit of claim 1, wherein the backlight unit has a reflection portion for causing the light from the light source to exit toward a certain direction, wherein the reflection portion comprises at least a first and a second

reflection layers having a predetermined level of light reflectance and transmittance, wherein the brightness gradient forming means has the reflection portion consisting of a first region with the first and second reflection layers being overlapped in the incident direction of light and a second region consisting of the first reflection layer only, and wherein brightness gradient is formed in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated by controlling reflectance of the reflection portion using the first region with relatively higher reflectance and the second region with lower reflectance than the first region.

9. The backlight unit of claim 1, wherein the backlight unit has a reflection portion for causing the light from the light source to exit toward a certain direction, wherein the reflection portion comprises at least a first and a second reflection layers having a predetermined level of light reflectance and transmittance, wherein the brightness gradient forming means has the reflection portion consisting of a first region with the first and second reflection layers being overlapped in the incident direction of light located at a position equivalent to the central portion in the horizontal direction on the surface to be illuminated, and a second region consisting of the first reflection layer only located at the both ends, and wherein brightness gradient is

formed in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated by controlling reflectance of the reflection portion in the horizontal direction on the surface to be illuminated and also by making the brightness of the light source located at the position equivalent to the central portion in the vertical direction on the surface to be illuminated relatively higher than the brightness of the light sources located at the both ends, using the first region with relatively higher reflectance and the second region with lower reflectance than the first region.

10. The backlight unit of claim 1, wherein the backlight unit has a reflection portion for causing the light from the light source to exit toward a certain direction, wherein the reflection portion comprises at least a first and a second reflection layers having a predetermined level of light reflectance and transmittance, wherein the brightness gradient forming means has the reflection portion consisting of a first region with the first and second reflection layers overlapped in the incident direction of light located at a position equivalent to the central portion in the vertical direction on the surface to be illuminated and a second region consisting of the first reflection layer only located at the both ends, and wherein brightness gradient is formed in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated by controlling

reflectance of the reflection portion in the vertical direction on the surface to be illuminated and also by making the brightness of the light source located at the position equivalent to the central portion in the horizontal direction on the surface to be illuminated relatively higher than the brightness of the light sources located at the both ends, using the first region with relatively higher reflectance and the second region with lower reflectance than the first region.

11. The backlight unit of claim 1, wherein the light source comprises a fluorescent lamp, wherein the brightness gradient forming means is provided on the glass tube of the fluorescent lamp, and wherein brightness gradient is formed in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated by controlling the transmittance of the glass tube.

12. The backlight unit of claim 1, wherein the backlight unit has a diffusion portion for diffusing the light from the light source, wherein the brightness gradient forming means is provided on the diffusion portion, and wherein brightness gradient is formed in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated by controlling the transmittance at the diffusion portion.

13. The backlight unit of claim 11 or 12, wherein the

brightness gradient forming means has a region providing relatively higher transmittance and another region providing relatively lower transmittance at the glass tube or the diffusion portion, and wherein brightness gradient is formed in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated by the difference in the transmittance.

14. The backlight unit of claim 13, wherein the brightness gradient forming means has transmittance gradient in which the transmittance at the glass tube or the diffusion portion changes little by little or step by step, and wherein brightness at the central portion on the surface to be illuminated of the object to be illuminated is made relatively higher than the brightness at the peripheral portion according to the transmittance gradient.

15. The backlight unit of any of claims 11 to 14, wherein the brightness gradient forming means is a dot pattern provided on the glass tube or the diffusion portion, and wherein the transmittance is controlled by the dot pattern.

16. The backlight unit of claim 15, wherein the transmittance of the glass tube or the diffusion portion provided with the dot pattern is controlled by any of the transmittance of a group of fine dots constituting the dot pattern, dot density, dot

shape and dot color, or any combination thereof.

17. The backlight unit of claim 16, wherein the distribution of the fine dots constituting the dot pattern has a substantially elliptical shape.

18. The backlight unit of claim 1, wherein the light source comprises fluorescent lamps, wherein the brightness gradient forming means is provided on the glass tube of the fluorescent lamps, and wherein the brightness gradient is formed in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated by controlling the tubular surface brightness on the glass tube.

19. The backlight unit of claim 18, wherein the brightness gradient forming means controls tubular surface brightness on the glass tube by optimizing the thickness of the fluorescent substance to be formed on the inner side of the glass tube of the fluorescent lamps at the position equivalent to the central portion on the surface to be illuminated of the object to be illuminated, and also by increasing or decreasing the optimized thickness at positions equivalent to peripheral portion on the surface to be illuminated of the object to be illuminated.

20. The backlight unit of claim 1, wherein the light source comprises LEDs, wherein the LEDs are arranged with

substantially equal surface density in each of the regions formed on the substrate of the backlight unit, wherein the brightness gradient forming means forms brightness gradient in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated by controlling radiation brightness or radiation wavelength of the LEDs.

21. The backlight unit of claim 20, wherein the brightness of the LEDs differs from each other in regions which are concentrically formed around the center of the substrate of the backlight unit.

22. The backlight unit of claim 1, wherein the light source comprises LEDs, wherein each of the LEDs has substantially equal brightness, wherein the brightness gradient forming means forms brightness gradient in the horizontal and vertical directions on the surface to be illuminated of the object to be illuminated by controlling the surface density of the LEDs in each of the regions formed on the substrate of the backlight unit.

23. The backlight unit of claim 22, wherein the surface density of the LEDs differs from each other in regions which are concentrically formed around the center of the substrate of the backlight unit.

24. A liquid crystal display device comprising the backlight unit of any of claims 1 to 23 and a liquid crystal panel to be illuminated by the backlight unit.

25. A liquid crystal display device for displaying images by irradiating illumination light from a backlight unit on a liquid crystal panel, wherein the liquid crystal display device has brightness gradient forming means to form brightness gradient in the horizontal and vertical directions on the display screen of the liquid crystal panel.

26. The liquid crystal display device of claim 25, wherein the brightness gradient forming means has a gradation conversion portion for carrying out a predetermined gradation conversion process for input image data, and a control portion for controlling switching of gradation conversion characteristics at the gradation conversion portion according to the input image data, and wherein the control portion forms brightness gradient in the horizontal and vertical directions on the display screen of the liquid crystal panel by switching gradation conversion characteristics at the gradation conversion portion based on the display screen position of the image data.

27. The liquid crystal display device of claim 25, wherein, as the brightness gradient forming means, the liquid crystal

panel is configured to have aperture ratios varied in accordance with the position on the display screen, and wherein brightness gradient is formed in the horizontal and vertical directions on the display screen of the liquid crystal panel by the variation of the aperture ratio.

28. The liquid crystal display device of any of claims 25 to 27, wherein the display screen of the liquid crystal panel has an aspect ratio of 16:9.